Joint Precision Approach And Landing System (JPALS)

JPALS Program Overview

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Program Description

- **Joint Precision Approach & Landing System (JPALS) will provide manned aircraft and ummanned aerial vehicles (UAVs) with a rapidly deployable, adverse weather, adverse terrain, day-night, survivable, and mobile precision approach and landing capability (PALC) that supports the principles of forward presence, crisis response and mobility. The capability will enable U.S. forces to land on any suitable surface world wide (land and sea), under both peacetime and hostile conditions, with ceiling and/or visibility the limiting factor.**
- **JPALS is a Joint Service Program with USAF, USN/USMC, and USA involvement**
- **JPALS is planned to be designated an ACAT 1D program**
  - **OSD level oversight**
  - **Presently in Technology Demonstration Phase**
  - **Milestone B for System Design and Development Phase is planned for APR 06**

Capability Gap

- **No single interoperable DoD / Civil precision approach and landing system**
  - **Only 30% of Navy and 50% of Army aircraft have ILS**
  - **PAR is not civil interoperable**
- **PAR and Mobile MLS are the only military deployable landing systems**
  - **Navy and Army not MLS capable**
  - **PAR and MMLS footprint too large for SOF**
- **Emerging sea based requirements cannot be met by any of the existing precision approach and landing systems**
  - **Joint Strike Fighter (JSF)**
  - **Joint Unmanned Combat Air System (J-UCAS)**
  - **Precision approach capability in Instrument Meteorological Conditions (IMC) operations in Emission Control (EMCON) environment**

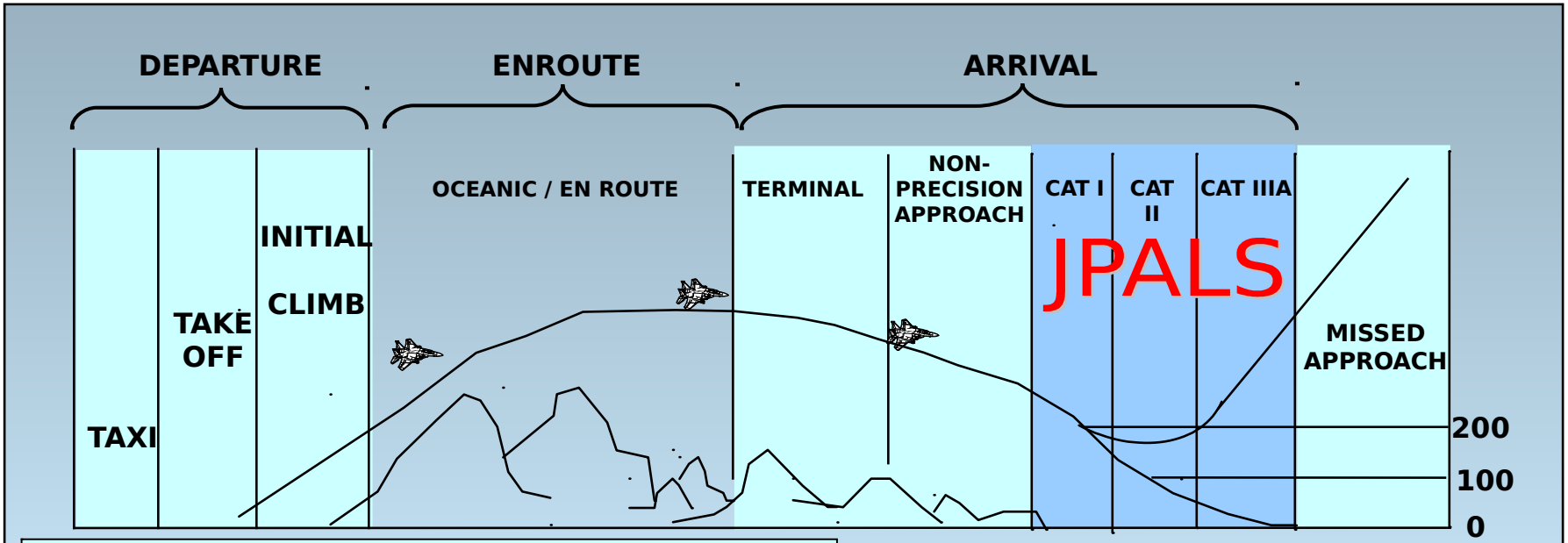
What JPALS Brings To The Warfighter

- **JPALS will fix DoD interoperability capability gap**
- **Potential to address:**
  - **US civil interoperability pending future of FAA LAAS program**
  - **International civil interoperability gap, but:**
    - **No clear way ahead for single international standard**
    - **Current standards include ILS, MLS and GNSS**
  - **International military interoperability pending establishment of PALC standard**
- **Spaced-based navigation in line with current trends**
- **Growth path to increased capability beyond core function of precision approach**

Mission Need Statement/ Phases of Flight

JROC validated Mission Need Statement, Aug 95

"…a rapidly deployable, adverse weather, adverse terrain, survivable, maintainable, and interoperable precision approach and landing system (on land and at sea) that supports the warfighter when ceiling and visibility are limiting factors…"



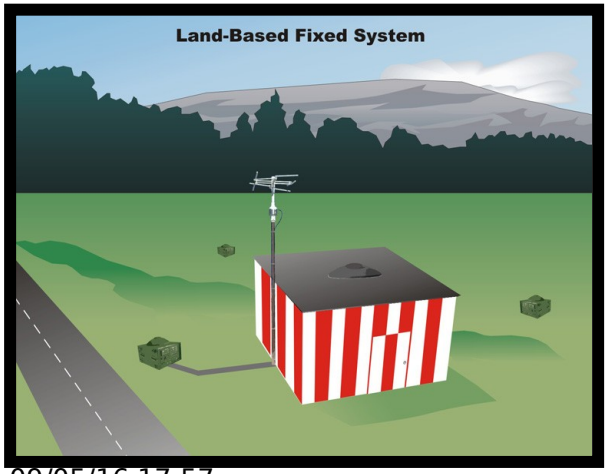
Note: Taxi, departure, missed and complex approaches and holding are all supported by JPALS, but not core requirements. Not all operations available in all mission environments.

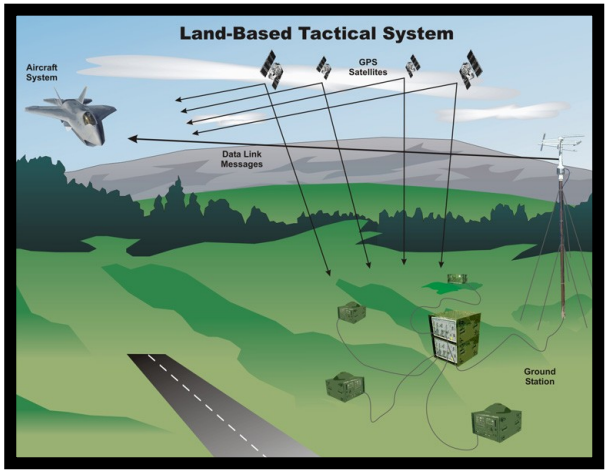
Category (CAT) I - 200 FT DH & 1/2 Mile Vis
CAT II - 100 FT DH & 1/4 Mile Vis
CAT IIIA - 0 FT DH & 700 FT Vis

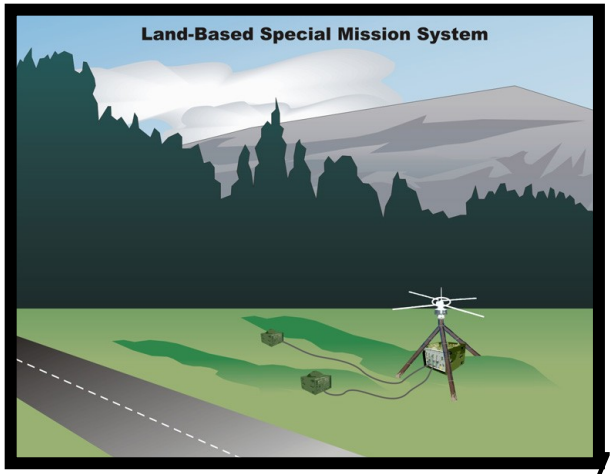
Operational Environments

Land-Based JPALS

- **Land-based JPALS uses local area differential GPS (LDGPS) to provide a PALS capability for fixed, tactical and special mission operations.**
- **The aircraft system receives data link messages from the ground station containing GPS range corrections and runway data. This data is then used to derive a differentially corrected navigation solution.**
- **Enabling technologies**
  - **Advanced anti-jam GPS systems**
  - **Military differential GPS accuracy and integrity solutions**
  - **Tactical VHF data link – with Info Assurance attributes for combat operations**



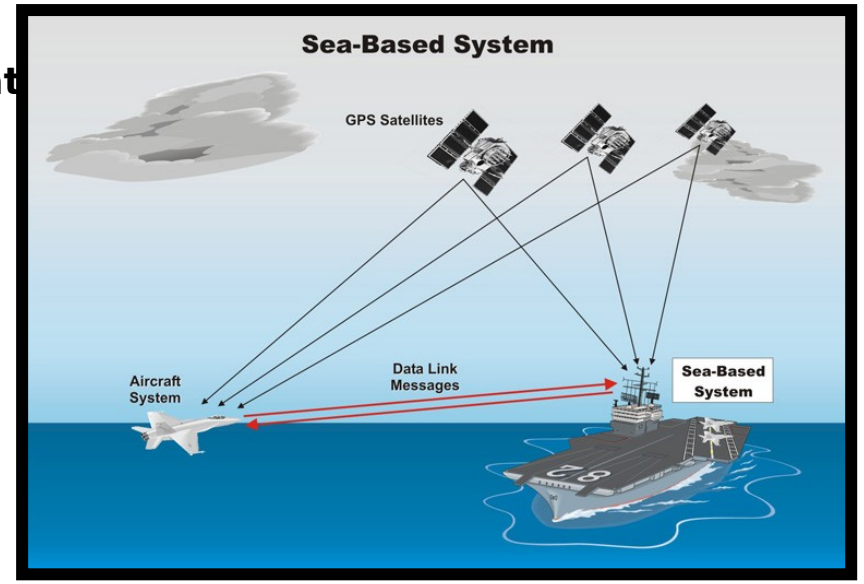




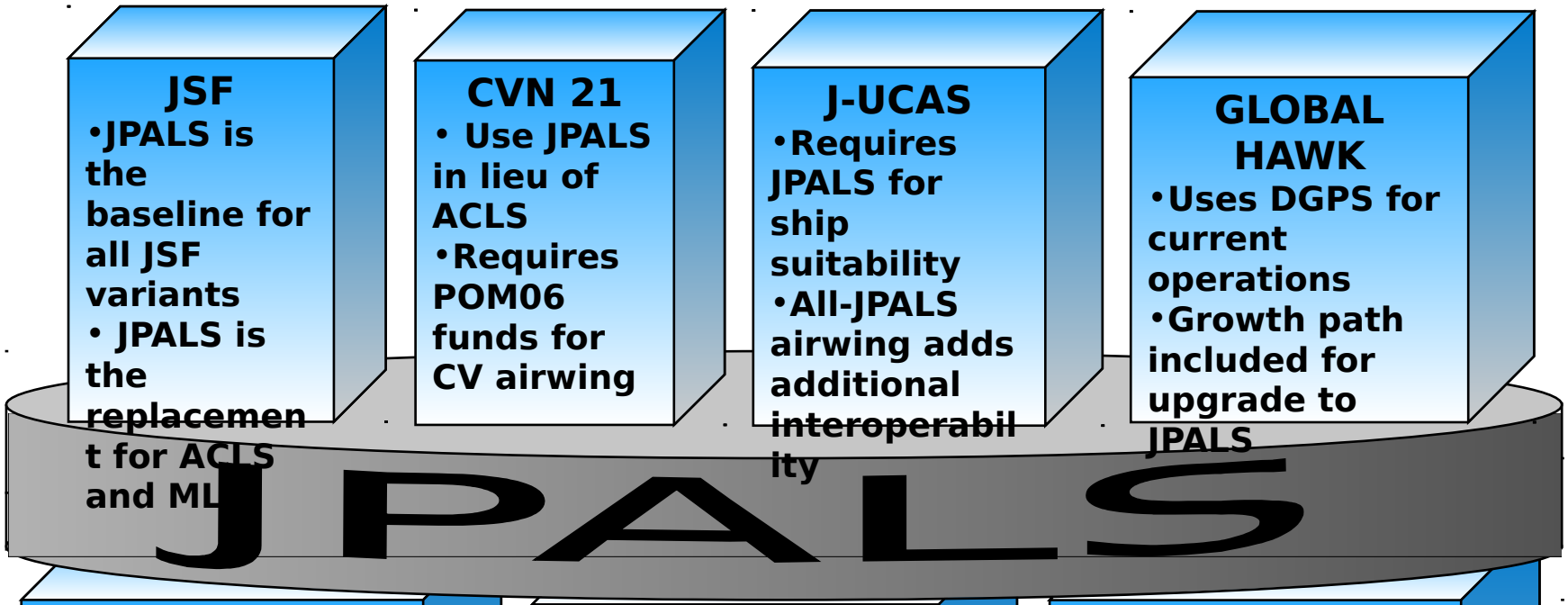
Sea-Based JPALS

- **Sea-based JPALS uses shipboard relative differential GPS (SRGPS) combined with an Inertial Navigation System solution to provide a PALS capability.**
- **Ship and aircraft, through a two-way data link, calculate a highly accurate relative solution as a means to remove common GPS errors.**
- **Enabling technologies**
  - **Differential Global Positioning System (GPS) with advanced anti-jam**
  - **Inertial Navigation System (INS)**
  - **Low Probability of Detection (LPD) dat link network**

Core capability for CVN-21



JPALS Inter-Dependencies


JSF
•JPALS is the baseline for all JSF variants
• JPALS is the replacement for ACLS and ML
CVN 21
• Use JPALS in lieu of ACLS
•Requires POM06 funds for CV airwing
J-UCAS
•Requires JPALS for ship suitability
•All-JPALS airwing adds additional interoperability
GLOBAL HAWK
•Uses DGPS for current operations
•Growth path included for upgrade to JPALS
JPALS
GPS
•Synchronization with modernization upgrades saves $
•Synch with NAVWAR AJ improvements
CNS/ATM
•Synchronization with some CNS/ATM integrations saves $
•CNS/ATM integrations can use JPALS data
Modified ARC-210 Radios and/or JTRS
•JPALS Data Link
•JTRS incorporate JPALS waveform
•Save $ for JSF

JPALS Accomplishments

- **Conducted shipboard test of SRGPS aboard the USS Roosevelt (CVN-71) accomplishing 10 fully auto-coupled landings in Apr 01.**
- **Completed LDGPS and anti-jam testing at Holloman AFB, NM during Jul-Aug 01 and Apr 04. Awaiting test report for Apr 04 test.**
- **Flew LAAS avionics (FedEx 727) against the LDGPS ground station to perform 10 auto-coupled landings.**
- **Pegasus X-47A Naval UCAV demonstrator first flight in Feb 03 achieved 4 inch GPS error on landing**

Technology Demonstration Summary

- **Preliminary guidance quality, vulnerability, and deployability analyses**
- **System Requirements Analysis, Functional Analysis and Allocation, Architecture Development**
- **Validate requirements through M&S, lab, field, and flight testing**
- **Assess the datalink needs of JPALS**
- **Evaluate incorporating JPALS capability into an EGI system**
- **Demonstrated**
  - **Precision approach feasibility in jamming**
  - **Civil (LAAS) interoperability**
  - **Precision at-sea auto landing capability for CV application**

Service Commitments & Responsibilities

- **Navy and Air Force are responsible for development of the common Land and Sea Based systems to be defined in the CDD and traced to the RFP for the SDD contract**
- **Services' roles and responsibilities will be described in a tri-service JPALS Program Memorandum of Agreement (MOA)**
- **For the SDD contract, initial efforts are being planned to ensure services' commitment to funding the development of the common systems. Most likely through consolidation of funding into a Single Lead Service PE**

Lead Service

- **USAF is currently Lead Service**
- **Navy assumes Lead Service by Milestone B (April 06).**
  - **Navy has significant drivers and greater funding commitment during SDD (CVN 21, J-UCAS, JSF) and may pursue expansion of the Navy Aircraft and Ship market during upcoming POMs**
- **A distributed management approach will maintain Program Management Offices at:**
  - **PMA213, COMNAVAIRSYSCOM, Webster Field, Pax River (Joint Program Management HQ Office/US Navy)**
  - **ESC/GAL, Air Force Electronic Systems Command, Hanscom AFB (USAF)**
  - **PEO Aviation, Redstone Arsenal, Huntsville (US Army)**

JPALS SDD RDT&E Funding Profile

Program Funding (TY$M)	FY06	FY07	FY08	FY09	FY10	FY11
Combined Joint Program Funding	38.4	63.6	59.8	73.5	TBD	TBD
Approximate Amount Available for Contracts	TBD	TBD	TBD	TBD	TBD	TBD

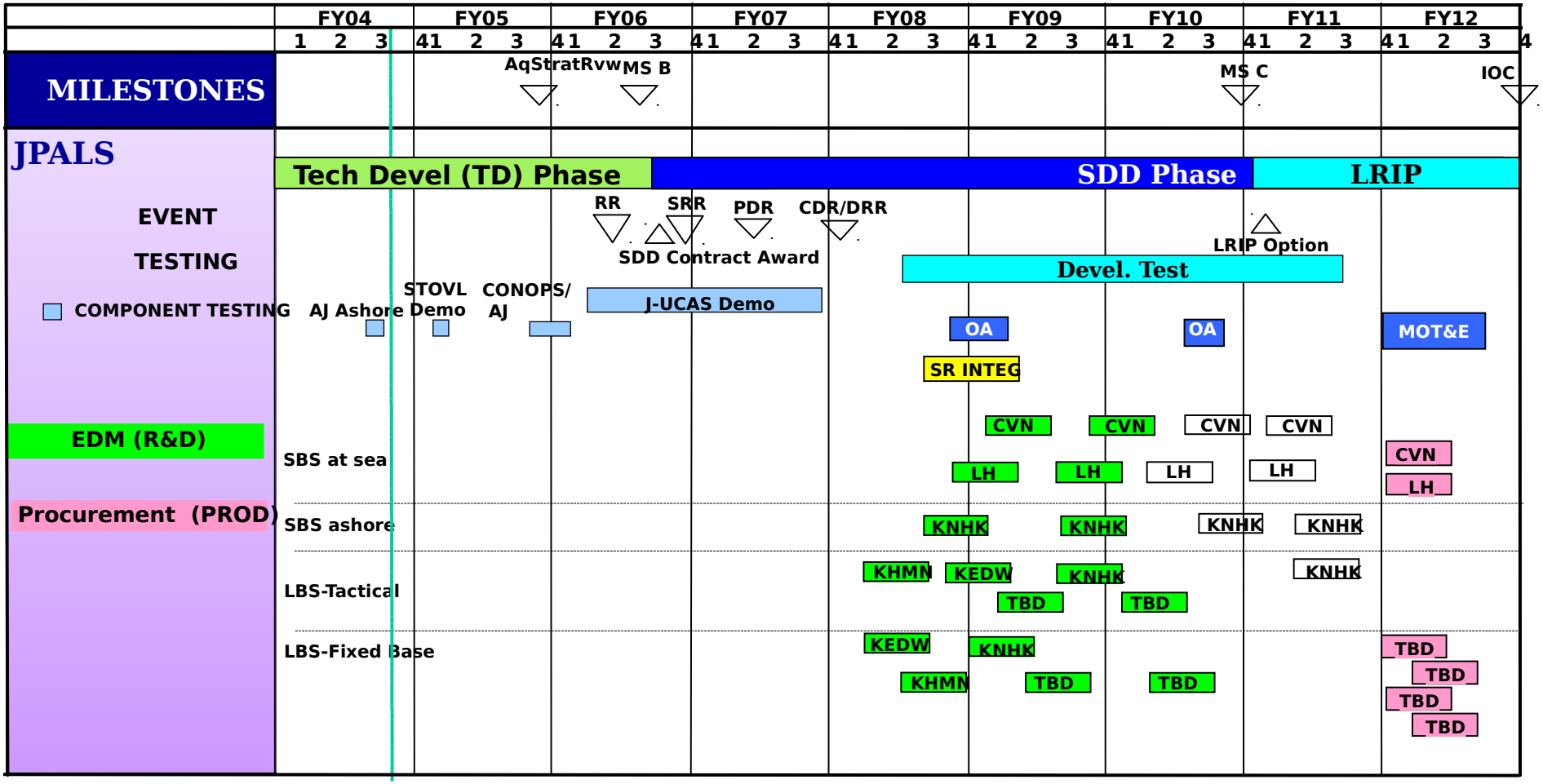
Gov't cost estimate being refined. Dollars available for industry includes prime, subcontract, etc notionally 70% - 75% of total funding line.

Service Cost Commitment

- **Procurement**
  - **Individual Services fund procurement, integration and installation for JPALS systems as required**

- **Operations and Support (O&S)**
  - **Lead Service will plan, program and fund for common Land and Sea Based non-platform specific JPALS in service support activity**
  - **Individual Services will fund (O&S) requirements for their specific JPALS installations and platforms**

JPALS High-Level Schedule



Potential JPALS Market

JPALS Variant	Navy and Marine Corps	Air Force	Army	Total
Land Based Fixed	40	93	34	167
Land Based Tactical	13	18	38	69
Sea Based (shipboard)	288			288
Airborne	3482	5630	4262	13,374
Special Mission (future development)	7	22	56	85

SUMMARY

- **GPS based precision approach and landing is achievable and offers significant benefits to the warfighter**
- **JPALS Program funded by the services and viable. Services working together towards an SDD Contract Award in MAY 06**
- **Early Industry involvement critical to timely contract award and development of the system**
- **JPALS offers a significant market for industry both at the prime/system integration level and subsystem/equipment/sub contractors level**